


APPENDIX A

MITIGATION EFFECTIVENESS GUIDE

The following guide identifies mitigation measures and conservation practices and rates their relative effectiveness to mitigate pesticide loss by pesticide loss pathway. Site-specific selection of appropriate pesticide management techniques and conservation practices needed to address identified resource concerns shall be left to the professional judgment of the planner and conservation objectives of the producer. Effects will vary due to practice design and site conditions and may need to be adjusted appropriately. Refer to Section V of the South Dakota Technical Guide (SDTG) to determine water quality impacts (Conservation Practice Effects) for conservation practices that are not listed in Appendix A. Relative effects on reducing pesticide loss are listed for a given pesticide loss pathway:

Relative Effect on Pesticide Loss

- (++) = Significant Positive Effect on Pesticide Loss
- (+) = Moderate Positive Effect on Pesticide Loss
- (+) = Slight Positive Effect on Pesticide Loss
- (-) = Slight Negative Effect on Pesticide Loss
- N/A = Generally No Appreciable Effect (Positive or Negative) on Pesticide Loss
- Multiple listing = Different impacts on pesticide loss depending on practice design and site conditions
-  Management Techniques/Conservation practices that **will be accounted for** in the Pesticide Screening Spreadsheet (PSS) or the Windows Pesticide Screening Tool (WIN-PST)>
- **Pesticide Loss Pathways:**
 - Wind Erosion = Pesticides are adsorbed to sediment transported by wind erosion processes (saltation, creep, and suspension)
 - Leaching = Pesticides move in solution through soil profile.
 - Solution Runoff = Pesticides transported in runoff water in solution.
 - Adsorbed to Sediment = Pesticides adsorbed to sediment in runoff water.
 - Concentrated Solution Runoff = Pesticide transported in runoff water in solution in concentrated channels/ditches, etc.
 - Concentrated Runoff Adsorbed = Pesticides adsorbed to sediment in runoff water transported in concentrated channels/ditches etc.

^{1/} & ^{2/} **Pesticide Management Measures/Relative Effectiveness to Mitigate Pesticide Loss by Pesticide Loss Pathway**

Pesticide Management Techniques	Wind Erosion	Leaching	Solution Runoff	Adsorbed to Sediment	Concentrated Solution Runoff	Concentrated Runoff adsorbed	Description/requirements
Application ^{1/} Timing	N/A	+	+	+	N/A	N/A	Apply pesticides according to label instructions and when conditions are optimal (soil conditions, rainfall events forecast, wind speed, etc.) to minimize pesticide losses decreasing environmental risk.
Band or Spot Application	N/A	+	+	+	N/A	N/A	Spot application, banding or directed spray according to pesticide label to decrease pesticide exposure and environmental risk.
Lower Application Rates including the use of Formulations and/or Adjuvants	N/A	+	+	+	N/A	N/A	Use applicable formulations and/or adjuvants to increase efficacy and decrease application rates according to pesticide labels or use the lowest effective application rate on pesticide labels to decrease environmental risk.
Mechanical or Biological Pest Control (entirely replaces pesticides)	N/A	++	++	++	N/A	N/A	Substitute mechanical or biological weed control such as cultivation or shredding or biological controls in lieu of pesticides (no pesticide use).
Mechanical or Biological Pest Control (reduce application rate of pesticides)	N/A	+	+	+	N/A	N/A	Substitute mechanical weed control such as cultivation or shredding and reduce pesticide rates or need of subsequent applications (reduced use of pesticides).
Partial Substitution	N/A	+	+	+	N/A	N/A	Use alternate pesticides in a tank mix or split applications to reduce application rate and decrease environmental risk. This management practice applies when the higher risk pesticide is applied at lower than maximum rates and the substituted pesticide(s) has a lower risk for loss in the designated pesticide loss pathway.
Set-backs	N/A	+	+	+	N/A	N/A	Setbacks between application areas and sensitive areas can decrease pesticide exposure and environmental risk, (includes no application in sensitive area).
Soil Incorporation	N/A	-	+	-	N/A	N/A	Soil incorporation can decrease the potential for surface losses (no applications in sensitive area itself).

^{1/} Refer to South Dakota Department of Agriculture and University of South Dakota Cooperative Extension publications and the pesticide label for additional information about pest management mitigation.

^{1/} **NonCropland, or Cropland Conversion Practices**

Conservation Practice	Wind Erosion	Leaching	Solution Runoff	Adsorbed to Sediment	Concentrated Solution Runoff	Concentrated Runoff adsorbed	Description/requirements
Brush Management (314)	N/A	++	++	++	N/A	N/A	Use of mechanical brush control and/or prescribed burning in lieu of chemical controls. Pesticide use requires environmental risk analysis and appropriate mitigation – see Pest Management Standard (595).
Conservation Cover (327)	+	+	+	+	N/A	N/A	Retiring land from annual crop production can increase infiltration and leaching and decrease sediment transport and pesticide requirements.
Grade Stabilization Structure (410)	N/A	N/A	N/A	+	+	+	Grade stabilization can decrease headcutting and sediment transport in natural and artificial channels and capture sediment from runoff and provide residence time for sediment to settle out of runoff water.
Pasture and Hay Planting (512)	+	+	+	+	N/A	N/A	Shifting land use to pasture and hayland can increase infiltration, leaching, and organic matter and decrease runoff and pesticide requirements.
Prescribed Burning (338)	-	+	+	+	N/A	N/A	Burning can increase sediment transport and reduce pesticide requirements.
Prescribed Grazing (528A)	+	+	+	+	N/A	N/A	Improves plant health and reduces the need for pesticides.
Range Planting (550)	+	+	+	+	N/A	N/A	Retiring land from annual crop production often reduces the need for pesticides, builds soil organic matter.
Tree and Shrub Establishment (612)	+	+	+	+	N/A	N/A	Retiring land from annual crop production often reduces the need for pesticides, builds soil organic matter.
Wetland Creation (658) Development or Restoration (657) or Constructed Wetland (656)	N/A	+	+	+	+	+	Captures pesticide residues and facilitates their degradation.

^{1/}Selected conservation practices will be incorporated in the conservation plan.^{2/}Refer to the SDTG, Section V, for additional information about Conservation Practice Physical Effects.

^{1/ & 2/} **Cropland Practices**

Conservation Practice	Wind Erosion	Leaching	Solution Runoff	Adsorbed to Sediment	Concentrated Solution Runoff	Concentrated Runoff Adsorbed	Description/requirements
Conservation Crop Rotation with more than one crop type. (i.e., warm season grass, cool season grass, warm or cool season broadleaf.	+	+	+	+	N/A	N/A	Conservation crop rotations where there are small grains, legumes, or warm season grasses (crops must be significantly different) can be used to decrease erosion and break pest lifecycles to decrease pesticide requirements.
Contour Buffer Strips (332)	N/A	N/A	+	+	N/A	+	Contour farming can increase infiltration and leaching and decrease runoff and sediment transport to surface water, less pesticides and nutrients are applied in grassed areas resulting in less leaching potential on some sites.
Contour Farming (330)	N/A	-	+	+	N/A	N/A	Contour farming can increase infiltration and leaching and decrease runoff and sediment transport to surface water.
Cover Crop (340)	+	+	+	+	N/A	N/A	Cover crops can increase organic matter and decrease erosion and movement of residual pesticides to surface and groundwater.
Cross Wind Ridges (589A)	+	N/A	+	+	N/A	N/A	Ridges installed perpendicular to the prevailing wind erosion and water flow direction can decrease transport of adsorbed pesticides.
Cross Wind Trap Strips (589C)	+	+	+	+	N/A	N/A	Strip of grass or suitable crops/crop stubble installed perpendicular to the prevailing wind erosion direction can decrease transport of adsorbed pesticides.
Deep Tillage (324)	+	-	+	+	N/A	N/A	Deep tillage can increase infiltration and leaching while decreasing runoff and wind erosion.
Field Border (386)	+	N/A	+	+	N/A	N/A	Field borders can decrease sediment transport and the extent of application areas, increase setback distances, and provide beneficial insect habitat and habitat to cause pest insects to congregate.
Filter Strip (393)	+	N/A	+	+	N/A	N/A	Filter strips can decrease sediment transport and the extent of application areas, increase infiltration and leaching and setback distances and provide beneficial insect habitat and habitat to cause pest insects to congregate.
Grassed Waterway (412)	+	+	+	+	+	+	Grassed waterways can increase infiltration and leaching and decrease sediment transport. (Apply with filter strips at the outlet and on each side of the waterway).

Conservation Practice	Wind Erosion	Leaching	Solution Runoff	Adsorbed to Sediment	Concentrated Solution Runoff	Concentrated Runoff Adsorbed	Description/requirements
Herbaceous Wind Barriers (603)	+	N/A	+	+	N/A	N/A	Narrow strip of grass installed perpendicular to the prevailing wind erosion and water flow direction can decrease transport of adsorbed pesticides.
Herbaceous Wind Barriers (603)	+	N/A	+	+	N/A	N/A	Narrow strip of grass installed perpendicular to the prevailing wind erosion and water flow direction can decrease transport of adsorbed pesticides.
Irrigation Land Leveling (464)	N/A	+	+	+	N/A	N/A	Land leveling can increase irrigation application uniformity and decrease pesticide transport to surface and groundwater.
Irrigation System Sprinkler (442)	N/A	+	+	+	N/A	N/A	Converting existing irrigated fields from gravity/surface irrigation systems to sprinkler. Irrigation Water Management (449) must be applied.
Irrigation System Tail Water Recovery (447)	N/A	+	+	+	+	+	Tail water recovery systems can increase leaching and decrease sediment transport (irrigation water management must be applied).
Irrigation Water Management (449)	N/A	+	+	+	N/A	N/A	Controlled application of irrigation water can minimize pesticide transport to surface and groundwater.
Residue Management, No-Till, Strip Till 329A	+	+	+	+	N/A	N/A	Leaving all crop residues on the soil surface increases infiltration, decreases erosion/sediment transport and builds soil organic matter.
Residue Management, Mulch-Till (329B)	+	-	+	+	N/A	N/A	Leaving crop residues on the soil surface can increase infiltration and leaching and decrease erosion and sediment transport.
Residue Management, Ridge Till (329C)	+	-	+	+	N/A	N/A	Leaving crop residues on the soil surface can increase infiltration and leaching and decrease erosion and sediment transport.
Riparian Forest Buffer (391) and Riparian Herbaceous Cover (390)	+	+	+	+	N/A	N/A	Riparian buffers can utilize and trap nutrients and chemicals in shallow groundwater and decrease sediment transport in surface flow.
Sediment Basin (350)	N/A	N/A	+	+	+	+	Sediment basins capture sediment from water erosion and provide residence time for sediment to settle out of runoff water.
Stripcropping (585)	+	-	+	+	N/A	+	Contour stripcropping for runoff and water erosion; wind stripcropping for wind erosion control. Stripcropping can also reduce small concentrated flow areas when placed across flow areas.

Conservation Practice	Wind Erosion	Leaching	Solution Runoff	Adsorbed to Sediment	Concentrated Solution Runoff	Concentrated Runoff Adsorbed	Description/requirements
Subsurface Drainage (606)	N/A	+	-	+	N/A	N/A	Collection and conveyance of drainage water can decrease leaching and sediment yield and increase aerobic pesticide degradation in the root zone. Avoid direct outlets to surface water.
Terrace (600)	N/A (if grassed = +)	-	+	+	+	+	Earthen embankments and/or channels constructed across the slope can increase infiltration and leaching while decreasing erosion and sediment transport.
Windbreak/ Shelterbelt Establishment (380)	+	+	+	+	N/A	N/A	Field Windbreaks installed perpendicular to prevailing wind direction within cropland fields
Water and Sediment Control Basin (638)	N/A	-	+	+	+	+	Water and sediment control basins capture sediment from water erosion and provide residence time for sediment to settle out of runoff water.

^{1/}Selected conservation practices will be incorporated in the conservation plan.

^{2/}Refer to the SDTG, Section V, for additional information about Conservation Practice Physical Effects.

REFERENCES:

USDA Natural Resources Conservation Service National Employee Development Center Nutrient and Pest Management Considerations in Conservation Planning Course materials

SDTG, Section V CPPE Matrix

USDA Natural Resources conservation Service Water Quality Indicators Guide Surface Waters SCS-TP-161, September 1989